CLAIMS

1. A magnetic lens comprising:

primary and secondary coil sections each having coil turns for generating additive magnetic fields thereby forming a resultant beam focusing field, the primary coil section having a larger number of coil turns than the secondary coil section, the sections being configured to have a substantially constant thermal signature when operated with their combined average generated power being substantially constant over an operational range of resultant field strengths;

wherein the secondary coil section is sufficiently responsive for implementing dynamic focusing when it is driven with a dynamic focusing current.

2. The lens of claim 1 further comprising a choke connected in series with the primary coil section for countering adverse flyback voltage effects.

3. The lens of claim 1, wherein the primary coil section is divided into first and second coil sub-sections with the secondary coil section disposed between said first and second primary coil sub-sections.

4. The lens of claim 3, wherein the first and second primary coil sub-sections have substantially the same number of coil turns.

5. The lens of claim 1 further comprising a cooling body mounted at a common end of the primary and secondary coil sections.

6. The lens of claim 5, further comprising thermally conductive covers thermally connecting one or more areas of the coil sections to the cooling body.

7. The lens of claim 1, wherein the electrically conductive coil turns are implemented with wire.

8. The lens of claim 7, wherein the wire in the primary and secondary coil sections have substantially the same resistivity characteristics.

9. The lens of claim 1, wherein the ratio of coil turns in the primary coil section to turns in the secondary coil section is greater than or equal to 2 to 1.

10. The lens of claim 1, wherein the secondary coil section is sufficiently responsive for implementing dynamic focusing as the beam is scanned at approximately 30 Hz frame rate or greater.

11. A SEM having a multi-coil lens in accordance with the magnetic lens described in claim 1.

12. A method for generating a beam focusing magnetic field in a SEM, comprising:

providing first and second coil sections configured to produce additive field components, the field components adding to form a resultant beam focusing field, wherein the first coil section has a larger number of coil turns than the second coil section;

driving the first coil section to generate the first section field component; and

driving the second coil section to generate the second section field component, the second coil section being driven with an AC signal component, wherein the first and second coil sections are driven to (i) produce a desired resultant field strength from a range of available field strengths, and (ii) generate substantially the same total average power over the range of available field strengths thereby maintaining a sufficiently constant thermal signature in the coil sections to allow for the resultant field strength to be changed without requiring a delay for thermal stabilization.

13. The method of claim 11, further comprising dynamically modulating a current signal for driving the second coil section to change the resultant field strength in accordance with changes in beam distance to a scan point.

14. The method of claim 13 in which the current is modulated by a sawtooth signal at approximately 30 Hz frame rate or greater.

15. The method of claim 11, wherein the first coil section is driven in only one direction, while the second section is driven in more than one direction.

16. The method of claim 11, wherein both the first and second coil sections are driven to have the same maximum allowed power densities.

17. A dual beam system having a controller for controlling a magnetic lens in an SEM, said controller accessible to instructions that when executed by the controller cause it to control the magnetic lens to produce a resultant beam focusing magnetic field in accordance with the method of claim 11.

18. A dual beam system having a charged particle column comprising:

a charged particle source assembly;

a holder for receiving a sample to be irradiated by said charged particle source;

a magnetic lens disposed between said charged particle source and said holder for focusing a charged particle beam emitted from said charged particle source, the magnetic lens including a first coil section having coil turns for generating a first section field component and a second coil section having coil turns for generating a second section field component, said coil sections being configured to produce a resultant beam focusing field that is the sum of said first and second section field components, wherein the first coil section has a greater number of turns than the second coil section resulting in the second coil section being more responsive than the first coil section; and

circuitry connected to said first and second coil sections, said circuitry adapted to drive the first and second coil sections to generate a selected resultant beam focusing field from a range of available resultant fields, wherein the total average power produced by both coil

sections is substantially constant throughout the range of available resultant fields, the coil sections being configured to have a substantially constant temperature signature throughout the coil sections when their total average power is substantially constant, wherein most current change in the coil sections for changing the resultant beam focusing field occurs in the second coil section.

19. The dual beam system of claim 16, wherein the charged particle column is offset from the holder at an angle thereby having different beam distances from the charged particle source to various scan points on the sample, the circuitry additionally driving the second coil section with a dynamic focusing current component to compensate for said beam length differences.

20. The system of claim 16, wherein the first coil section has first and second sub-section components sandwiched around the second coil section.

21. The system of claim 16, wherein the first and second coil section turns are at least partially bi-flair wound together.

22. The system of claim 16, wherein the charged particle column is a SEM.